

SECTION 01 81 19 - INDOOR AIR QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Construction Indoor Air Quality (IAQ) Management as required by LEED® 2009 for Commercial Interiors Rating System (LEED-CI 2009) Indoor Environmental Quality (IEQ) Credit 3.1 and 3.2, as outlined within this Section and in the Sections referenced herein. Throughout this section, the term LEED is used in place of LEED-CI 2009.
 - 1. Provide low-emitting products as required by IEQ Credits 4.1, 4.2, 4.3, 4.4 and as specified.
 - 2. Provide filtration media as required by IEQ Credit 5 and as specified.
 - 3. Provide products as required herein.
- B. Related sections: The following sections contain requirements that relate to this section:
 - 1. Division 01 Section "Sustainable Design Requirements-LEED" for LEED compliance and documentation requirements relating to indoor air quality.

1.2 REFERENCES

- A. See Division 01 Section "Sustainable Design Requirements-LEED" for standards referenced herein.
- B. LEED Reference Guide for Green Interior Design and Construction: For the Design, Construction and Renovation of Commercial and Institutional Interiors Projects, 2009 Edition, with current addenda.
 - 1. IEQ Credit 3 "Construction IAQ Management Plan."
 - 2. IEQ Credit 4 "Low Emitting Materials."
 - 3. IEQ Credit 5 "Indoor Chemical and Pollutant Source Control."

1.3 IAQ MANAGEMENT PLAN SUBMITTALS

- A. Within 60 days prior to scheduled building enclosure, submit for approval:
 - 1. Detailed Construction Indoor Air Quality Management Plan, During Construction, in accordance with requirements of LEED IEQ Credit 3.1 and as outlined in this Section.
 - a. Meet or exceed control measures of Sheet Metal and Air Conditioning Contractor's National Association Indoor Air Quality Guidelines and as described within this Section.
 - b. Protect stored on site and installed absorptive materials from moisture damage.

- c. Use filtration media with a minimum efficiency reporting value (MERV) of 8 at each return grille, if permanently installed air handlers are used during construction.
 - d. Detailed products and procedures for compliance with execution requirements outlined in Parts 2 and 3 of this Section.
- 2. Detailed Construction Indoor Air Quality Management Plan, Prior to Occupancy, in accordance with requirements of LEED IEQ Credit 3.2 and as outlined in this Section. As directed by Owner, comply with one compliance path below:
 - a. Option 1: Flush-out Schedule describing procedures and dates and as described elsewhere in this Section. Include calculations to demonstrate that the required total air volumes and minimum ventilation volumes and rates will be delivered.
 - b. Option 2: IAQ Testing Schedule describing procedures and dates and as described elsewhere in this Section.
- 3. Detailed products and procedures for compliance with execution requirements outlined in Parts 2 and 3 of this Section.
- 4. Photographs demonstrating compliance with IEQ Credit 3.1. Provide at the three construction milestones, such as the following: 50 percent, 75 percent, and 95 percent.

1.4 PRODUCT DATA SUBMITTALS

- A. Manufacturer product data indicating MERV rating of temporary and permanent filtration media with statement of where and when each filter was installed.
- B. Manufacturer product data indicating chemical content and Green Seal certification of cleaning products.
- C. Low-Emitting Materials: For each low-emitting product submitted, provide the following product data:
 - 1. Adhesives, sealants, paints and coatings: VOC content as measured in grams per Liter (g/L).
 - 2. Carpet: Proof of Green Label Plus certification.
 - 3. Carpet Cushion: Proof of Green Label certification.
 - 4. Resilient Flooring System: Proof of FloorScore certification or alternate compliance.
 - 5. Composite wood and agrifiber products: Manufacturer declaration that product contains no added urea-formaldehyde.
 - 6. Laminating Glues: Manufacturer declaration that product contains no added urea-formaldehyde.

1.5 CLOSEOUT SUBMITTALS

- A. General: At completion of construction and prior to contract close-out, submit the following for information purposes in electronic format.
- B. Final Construction Indoor Air Quality Management, During Construction, Package for IEQ Credit 3.1. At completion of construction and prior to contract close-out, submit:

1. Approved Construction Indoor Air Quality Management Plan.
 2. Construction Photographs: Six taken at 3 separate times for a total of eighteen (18) digital photographs of required construction indoor air quality management measures.
 - a. HVAC protection.
 - b. Source Control
 - c. Pathway Interruption
 - d. Housekeeping
 - e. Scheduling
 - f. Protection of absorptive or dry sink materials, including but not limited to carpet, gypsum board, acoustical ceiling tiles, and insulation.
 - g. Temporary filtration media, if HVAC is operated during construction.
 - h. Filtration Media installed prior to occupancy.
 3. Product data of filtration media used during construction and installed immediately prior to occupancy including MERV values, manufacturer's name and model number.
 4. Meeting minutes, checklists, worksheets, notifications and deficiency or resolution logs related to the project IAQ issues.
 5. Final IEQ Credit 3.1 Online Template indicating compliance with credit requirements.
- C. Final Construction Indoor Air Quality Management Plan, Prior to Occupancy, Package for IEQ Credit 3.2. At completion of construction and prior to contract close-out, submit:
1. Option 1: Approved Flush-out Schedule including a statement that space was not occupied until after delivery of minimum outside air requirements were met.
 2. Option 2: Baseline Indoor Air Quality Testing reports showing results and location of each test indicating that the maximum chemical contaminate concentration requirements are not exceeded, a summary of HVAC operating conditions, a listing of discrepancies and recommendations for corrective actions, if needed.
 - a. Include certification of test equipment calibration with each test report.
 3. Final IEQ Credit 3.2 Online Template indicating compliance with credit requirements.
- D. Final Low Emitting Materials Package for IEQ Credits 4.1, 4.2, 4.3, 4.4. Provide individual electronic folders for each credit containing:
1. Legible electronic copies of relevant material product data, with applicable criteria highlighted, for each product listed on the LEED Online Template.
 2. Final LEED Online Template including all low-emitting materials used on Project.
- E. LEED Online: Final LEED Online Template and associated required documentation uploaded to LEED Online for each of the following Credits:
1. IEQ Credit 3.1, Construction Indoor Air Quality Management, During Construction.
 2. IEQ Credit 3.2, Construction Indoor Air Quality Management, Prior to Occupancy.
 3. IEQ Credit 4.1, Low Emitting Materials, Adhesives and Sealants.
 4. IEQ Credit 4.2, Low Emitting Materials, Paints and Coatings.
 5. IEQ Credit 4.3, Low Emitting Materials, Flooring Systems.
 6. IEQ Credit 4.4, Low Emitting Materials, Composite Wood and Agrifiber Products.

1.6 PROJECT MEETINGS

- A. Construction indoor air quality management to be discussed as required in Division 01 Section “Sustainable Design Requirements-LEED.”

PART 2 - PRODUCTS

2.1 LOW-EMITTING MATERIALS

- A. Adhesives applied within the building waterproofing envelope to have a VOC content not more than 20 g/L, less water and exempt solvents. Where products are unavailable or use of such products will compromise performance or warranty, comply with VOC content limits below, of South Coast Air Quality Management District (SCAQMD) Rule 1168 “Adhesive and Sealant Applications.” Adhesives and Sealants integral to waterproofing system are exempt.
 - 1. Indoor Carpet & Pad Adhesives: 50
 - 2. Wood Flooring Adhesive: 100
 - 3. Rubber Floor Adhesives: 60
 - 4. Subfloor Adhesives: 50
 - 5. Ceramic Tile Adhesives: 65
 - 6. VCT and Asphalt Tile (and Linoleum) Adhesives: 50
 - 7. Dry Wall and Panel Adhesives: 50
 - 8. Cove Base Adhesives: 50
 - 9. Multipurpose Construction Adhesives: 70
 - 10. Structural Glazing Adhesives: 100
 - 11. PVC Welding: 510
 - 12. CPVC Welding: 490
 - 13. ABS Welding: 325
 - 14. Plastic Cement Welding: 250
 - 15. Adhesive Primer for Plastic: 550
 - 16. Contact Adhesive: 80
 - 17. Special Purpose Contact Adhesive: 250
 - 18. Structural Wood Member Adhesive: 140
 - 19. Metal to metal substrates: 30
 - 20. Plastic foam substrate: 50
 - 21. Porous substrate except wood: 50
 - 22. Wood substrate: 30
 - 23. Fiberglass substrate: 80
 - 24. All Other Welding & Installation Adhesives: 250
- B. Aerosol Adhesives applied within building waterproofing envelope to comply with the VOC Content limits, as expressed in percentage of VOC by weight, of Green Seal Standard GS-36 “Commercial Adhesives,” October 19, 2000 as follows:
 - 1. General Purpose Mist Spray: 65% VOCs by weight
 - 2. General Purpose Web Spray: 55% VOCs by weight
 - 3. Special Purpose Aerosol Adhesives (all types): 70% VOCs by weight

- C. Sealants applied within the building waterproofing envelope to have a VOC content not more than 20 g/L, less water and exempt solvents. Where products are unavailable or use of such products will compromise performance or warranty, comply with VOC content limits of SCAQMD Rule 1168 "Adhesive and Sealant Applications," amended January 7, 2005, as follows:
1. Architectural Sealants: 250
 2. Non-membrane Roof: 300
 3. Single-Ply Roof Membrane: 450
 4. Other: 420
- D. Sealant primers applied within building waterproofing envelope to comply with VOC content limits, as expressed in grams per Liter, less water and exempt compounds, of SCAQMD Rule 1168 "Adhesive and Sealant Applications," amended January 7, 2005, as follows:
1. Architectural, Nonporous: 250
 2. Architectural, Porous: 775
 3. Other: 750
- E. Paints and coatings applied within building waterproofing envelope to comply with the following VOC content limits of Green Seal Standard GS-11 "Paints," Green Seal Standard GC-03 "Anti-Corrosive Paints," Second Edition, January 7, 1997; and SCAQMD Rule #1113 "Architectural Coatings," as follows:
1. Flat Topcoat: 50
 2. Non-flat Topcoat, Primer, Undercoat: 100
 3. Anti-corrosive & Anti-Rust Paint (ferrous metal substrates): 250
 4. Clear Wood Finishes, Varnish: 275
 5. Clear Wood Finishes, Sanding Sealer: 275
 6. Clear Wood Finishes, Lacquer Sealer: 275
 7. Clear Brushing Lacquer: 275
 8. Concrete Curing Compound: 100
 9. Dry-fog Coatings: 150
 10. Fire Retardant Coatings, Clear: 650
 11. Fire Retardant Coatings, Pigmented: 350
 12. Floor Coatings (opaque): 50
 13. Graphic Arts (sign) Coatings: 500
 14. Industrial Maintenance Coatings: 100
 15. Japans/ Faux Finish Coatings: 350
 16. Low-Solids Coating: 120
 17. Mastic Coatings: 300
 18. Metallic Pigmented Coatings: 500
 19. Multicolor Coatings: 250
 20. Pigmented Lacquer: 275
 21. Pretreatment Wash Primers: 420
 22. Primers, Sealers and Undercoaters: 100
 23. Quick-Dry Enamels: 50
 24. Recycled Coatings: 250
 25. Shellac, Clear: 730
 26. Shellac, Pigmented: 550

27. Specialty Primers: 100
 28. Stains: 100
 29. Traffic Coatings: 100
 30. Waterproofing Sealer: 100
 31. Waterproofing Concrete, Masonry Sealers: 100
- F. Carpets to meet testing and product requirements of the Carpet & Rug Institute Green Label Plus program.
- G. Carpet cushion to meet testing and product requirements of the Carpet & Rug Institute Green Label program.
- H. Resilient Flooring System (vinyl, linoleum, laminate, rubber, wood - except solid wood): comply with the testing and product requirements of the Resilient Floor Covering Institute's FloorScore Program.
1. Option 1: Comply with the testing and product requirements of the California Department of Health Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
 2. Option 2: Certified by GREENGUARD Children and Schools.
 3. Option 3: Comply with California Section 01350.
 4. Option 4: Listed in the Collaborative for High Performance Schools (CHPS) Product Database (Low-Emitting Materials Table).
- I. Permanently installed composite wood and agrifiber products (particleboard, medium density, plywood, wheatboard, strawboard, panel substrates and door cores) to contain no added urea-formaldehyde. Plywood materials shall not emit formaldehyde in excess of 0.2 parts per million (ppm) and particleboard materials shall not emit formaldehyde in excess of 0.3 ppm.
- J. Laminating adhesives used in composite wood and agrifiber product assemblies, shop-applied and applied on-site, to contain no added urea-formaldehyde.
- K. Insulation to be manufactured using no chlorofluorocarbons (CFC's). Insulation to emit no more than 0.05 ppm formaldehyde.
- L. Wall covering to be chlorine-free and plasticizer-free.
- 2.2 AIR FILTRATION MEDIA
- A. Temporary Filters: Filtration media rated for minimum efficiency reporting value (MERV) when tested in accordance with ASHRAE 52.2.
1. MERV of 8, minimum.
- B. Permanent Filters for outdoor air intake: Filtration media rated for minimum efficiency reporting value (MERV) when tested in accordance with ASHRAE 52.2.
1. MERV of 13, minimum.

2.3 CLEANING PRODUCTS AND EQUIPMENT

- A. Use Green Seal qualified spot removers and cleaning agents for each given application.
- B. HEPA-filter equipped vacuum cleaners shall be used for the final cleaning.

PART 3 - EXECUTION

3.1 GENERAL

- A. Incorporate procedures and processes during Construction and prior to occupancy as described herein.

3.2 HVAC PROTECTION

- A. If permanent HVAC is used during construction, filtration media shall be used at each return air grill. All HVAC systems, equipment and pathways shall be dust and particulate free at time of substantial completion of that phase of construction, in accordance with SMACNA "IAQ Guidelines for Occupied Buildings Under Construction."
 - 1. Begin construction ventilation when building is substantially enclosed.
 - 2. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.
- B. HVAC system shall be kept clean, free of dust, debris, moisture, gaseous and microbial contamination during storage, handling, installation and punch-out. Inspect all air inlets, air outlets, grilles, diffusers, plenums, and ducts upon completion of Work.
 - 1. Cover and protect (taped plastic or similar method) all exposed air inlet and outlet openings, grilles, ducts, plenums, to prevent water, moisture, dust and other contaminate intrusion.
 - 2. Apply protection immediately after installation of equipment and ducting.
 - 3. Ducting runs that require more than a single day to install shall be protected at end of each day's Work.
 - 4. Leaks in return ducts and air handlers shall be checked and repaired. Do not use mechanical rooms for construction storage.
 - 5. Inspect filtration monthly and replace as needed with new media throughout the HVAC system. Filtration media shall be minimum MERV 8.
 - 6. After final phase of construction, install new filtration media throughout the HVAC system.
 - 7. Cleaning of ductwork is not part of this contract; however Contractor shall bear cost of cleaning required by Owner due to failure of Contractor to protect ducts and equipment from construction pollutants as specified.
- C. If an unducted plenum must be used over a construction zone, all ceiling tiles shall be installed prior to HVAC use.

3.3 SOURCE CONTROL

- A. Comply with Product specifications.
- B. Provide direct exhaust to the exterior during installation of strong emitting materials, including touch-up activities. Keep exhaust away from intakes and occupied spaces.
- C. Protect “absorptive” or dry sink materials from exposure to dust, debris and moisture contamination during product delivery, storage and handling from construction/ demolition and punch-out activities.
- D. Provide adequate ventilation of packaged dry products prior to installations. Remove from package and place in a secure, dry, well-ventilated space, free from contaminant sources and residues. Provide a temperature range of 60 degrees F minimum to 90 degree maximum continuously during ventilations period. Do not ventilate within limits of Work unless otherwise approved by Architect.
- E. “Bake-out” or “super-heating” of spaces to accelerate the release of gaseous emissions is not permitted.
- F. Prohibit smoking and use of fossil-fueled temporary heating units inside the building and near building entrances, windows and intakes and within 25 feet of building entrances.

3.4 PATHWAY INTERRUPTION

- A. Provide negative pressurization of spaces under construction and/or demolition and positive pressurization of occupied or finished spaces while construction work proceeds in adjacent areas.
- B. Relocate pollutant sources when project equipment or staging areas coincide with critical air flow pathways and place plastic barriers to contain construction areas.
- C. Temporarily seal building, including air intakes and exhaust vents, and any other building openings, when dust-generating or strong-emitting construction products or procedures are used on the exterior of the building.
- D. Once spaces within building become occupied, work areas must remain under negative pressure. Exhaust air at a rate at least 10% greater than the rate of supply. Do not exhaust air where it can be drawn back into occupied spaces and place a continuous plastic barriers creating a seal between construction areas and occupied spaces.

3.5 HOUSEKEEPING

- A. Broom clean and vacuum floors to keep dust from accumulating during construction and/or demolition. Remove debris from building on a daily basis and suppress dust during construction and/or demolition activities with wetting agents or sweeping compounds.
- B. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

1. Inspect duct intakes, return air grilles, and terminal units for dust. Clean plenum spaces, including top sides of lay-in ceilings, outside of ducts, tops of pipes and conduit, and return plenums of air handling units.
 2. Clean tops of doors and frames.
 3. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 4. Remove intake filters last, after cleaning is complete.
- C. Ensure food and food packaging is not left on the jobsite.
- D. Use low-toxic pest control chemicals such as boron, if needed, unless otherwise directed.
- E. Final cleaning shall be detailed and shall use a HEPA-filter vacuum throughout.
- F. Remove spills or excess application of solvent-containing products as soon as possible. Use low-emitting cleaning agents described under CLEANING PRODUCTS AND EQUIPMENT.
- G. Keep work areas as dry as possible. Replace any absorptive (dry sink) material that is exposed to moisture.

3.6 SCHEDULING

- A. Coordinate construction activities to minimize or eliminate disruption of operations in occupied portions of building.
- B. Schedule for storage, installation, and protection of all components of air distribution systems.
- C. Schedule for storage, installation, and protect of absorptive materials (woven, fibrous or porous in nature, such as carpet, ceiling tiles, insulation, and fabrics) from exposure to emissions during and after installation from materials and finishes with potential for short-term release of off-gassing volatile organic compounds.
1. Highlight critical methods used to protect absorptive materials from airborne pollutants such as: dust, debris, moisture, gaseous and microbial contamination.
 2. Sequence installation of absorptive materials after odor-emitting activities have occurred and have been mitigated by ventilation
- D. Do not store absorptive materials on-site if protection measures as described above cannot be ensured.
- E. Avoid building occupancy while construction related pollutants are present.
- F. Ensure proper and complete curing of concrete before covering.

3.7 INDOOR AIR QUALITY MANAGEMENT, PRIOR TO OCCUPANCY

- A. Comply with one of the following:

1. Option 1 Flushout: After construction ends and prior to occupancy with all interior finishes installed and the building has been completely cleaned, install new filtration media. Supply a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while maintaining an internal temperature of at least 60°F and, where mechanical cooling is operated, relative humidity no higher than 60%.
 - a. Space may be occupied following delivery of a minimum of 3,500 cu.ft. of outside air per sq.ft. of floor area to space, and provided the space is ventilated at minimum rate of 0.30 cfm/cu.ft. of outside air or the design minimum outside air rate, whichever is greater, a minimum of three hours prior to the occupancy and during occupancy, until the total of 14,000 cu.ft./sq.ft. of outside air has been delivered to the space.
 - b. Do not start flush-out in any area until:
 - 1) All construction is complete.
 - 2) HVAC systems have been tested, adjusted, and balanced for proper operation.
 - 3) Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
 - 4) New HVAC filtration media have been installed.
2. Option 2: If schedule does not permit Building Flushout provide Air Quality Testing: After construction ends and prior to occupancy with all interior finishes installed and the building has been completely cleaned, use testing protocols consistent with US EPA “Compendium of Methods for the Determination of Air Pollutants in Indoor Air” and as additionally detailed in the LEED 2009 Green Building Design and Construction Reference Guide.
 - a. Contractor shall provide the services of a qualified Indoor Air Quality Testing Services Firm.
 - b. Support the Indoor Air Quality Testing Services Firm by coordinating scheduling of required testing, and providing services during IAQ remediation if necessary.
 - c. Test for the following contaminant concentration levels:

Chemical Contaminant	Maximum Concentration
Carbon Monoxide (CO)	9 parts per million and no greater than 2 ppm above outdoor levels
Formaldehyde	27 parts per billion
Particulates (PM10)	50 micrograms per cubic meter
TVOC	500 micrograms per cubic meter
*4-Phenylcyclohexene (4-PCH)	6.5 micrograms per cubic meter

*This test is only required if carpets and fabrics with styrene butadiene rubber (SBR) latex backing material are installed as part of the base building systems.

- d. For each sampling point where maximum concentration limits are exceeded conduct flush-out with outside air and retest the specific parameter(s) that were exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as the first test.

- e. All measurements shall be conducted prior to occupancy, but during normal occupied hours and with building ventilation system starting at regular daily start time and operated at minimum outside air flow rate for occupied mode throughout duration of the air testing.
- f. Building shall have all interior finishes installed. Non-fixed furnishings such as workstations and partitions are required to be in place for testing.
- g. For each portion of Project served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 or for each contiguous floor area, whichever is larger, and include areas with the least ventilation and greatest presumed source strength.
- h. Air samples shall be collected between 3 feet and 6 feet from the floor over a minimum 4-hour period.

END OF SECTION 01 81 19